Investigation of respiratory outcomes in the Agricultural Health Study

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The Agricultural Health Study

The Agricultural Health Study (AHS) is designed to study a wide range of health effects of agricultural exposures in farmers and their families.

The AHS is a prospective cohort study of licensed pesticide applicators and farm spouses in Iowa and North Carolina
- ~52,000 private pesticide applicators (farmers)
- ~32,000 farm spouses
- ~5,000 commercial pesticide applicators

Enrolled in 1993-7
Reinterviewed every 5 years

Detailed information on:
- pesticide use
- farming history
- medical history
- demographic and behavioral characteristics

Validation of exposure information through field monitoring.

Linked annually to cancer and death registries

Collaboration among NCI, NIEHS, EPA, and NIOSH (National Institute of Occupational Safety and Health)

www.aghealth.org

Respiratory Disease in the AHS

	Applicators	Spouses	US National Rates	
			NHIS 99	NHANES 99
Asthma	4.9 %	4.7 %	8.5 %	12.3 %
Bronchitis	4 %	4.3 %	4.4 %	3.2 %
Emphysema	1%	0.3 %	1.4 %	1 %
Farmers Lung	2 %	0.2 %		
Hay fever	9.6 %	9.9 %	8.9 %	4.6 %
Wheeze	20%			13 %

Background

Farmers and Respiratory Disease

Farmers have higher rates of respiratory disease including:
- asthma, chronic bronchitis, farmers lung, and deficits in pulmonary function.

Known risk factors include:
- animals, dusts, and grains.

Little is known about respiratory health effects of pesticides.

Pesticide exposures are overlooked as contributors to respiratory disease among farmers, because
- Other respiratory exposures are more common
- Dermal exposure to pesticides is believed to be more important than respiratory exposure
- Limited animal data

Methods

We looked for risk factors for wheeze among the farmers and commercial pesticide applicators.

Outcome:

Wheeze was the most common respiratory outcome reported among farmers
- Higher than US population rates
- Characteristic of asthma

Based on self-reported episodes of wheeze in past year

Population:

~20,000 farmers

~ 2,000 commercial pesticide applicators

Exposure Assessment:

Pesticide use in the past year
- 40 individual chemicals
- Functional groups
- ever and frequency of use

Statistical Methods:

Logistic Regression controlling for age, smoking status, asthma, atopy, state, and, for commercial applicators, body mass index (BMI)

Results

Findings for Farmers

19% of 20,468 farmers reported wheeze

11 of 40 pesticides were positively associated with wheeze
10 had significant dose response trends

3 Organophosphate insecticides
- Parathion (OR=1.5, 95% CI=1.0,2.2)
- Malathion (OR=1.1, 95% CI=1.0,1.3)
- Chlorpyrifos (OR=1.1, 95% CI=1.0,1.3)

7 Herbicides
- Paraquat (OR=1.3, 95% CI =1.0,1.6)
- Chlorimuron ethyl (OR=1.1, 95% CI=1.0,1.3)

Odds ratios were small (1.1-1.5)

Findings for Commercial Pesticide Applicators

21% of 2255 commercial applicators reported wheeze

12 of 40 pesticides were positively associated with wheeze
10 of these had significant dose response trends

5 Organophosphate insecticides
- chlorpyrifos (OR=1.5, 95% CI=1.1, 2.0)
- dichlorvos (OR=2.3, 95% CI=1.0, 5.1)
- fonofos (OR=1.8, 95% CI=1.1, 3.0)
- phorate (OR=2.9, 95% CI=1.7, 4.8)
- terbufos (OR=1.7, 95% CI=1.1, 2.5)

8 Herbicides
- chlorimuron ethyl (OR=1.6, 95% CI=1.3,2.1)

Significant Odds Ratios ranged from 1.4 to 2.9

Dose response models for chlorpyrifos and wheeze

	Farmers			Commercial Applicators		
Days used	OR	95% CI		OR	95% CI	
None	1.0			1.0		
< 5	1.0	0.9	1.2	1.0	0.6	1.8
5-9	1.3	1.1	1.6	1.1	0.6	2.1
10-19	0.9	0.7	1.2	0.8	0.4	1.5
20-39	1.6	1.1	2.3	2.0	1.0	3.7
40+	--			2.4	1.2	4.7

Dose response model for chlorpyrifos suggests that the respiratory effects are associated with 20 or more days of chlorpyrifos application

Conclusions

Pesticides may be overlooked risk factors for respiratory health effects

The Agricultural Health Study is a useful resource to assess the potential respiratory health effects

Future work will focus on respiratory disease
- asthma, chronic bronchitis, farmers lung

NIEHS National Institute of Environmental Health Sciences

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